PINE CREEK BRIDGE
(East Titusville Bridge)
Pennsylvania Historic Bridges Recording Project - II
Spanning Pine Creek at Messerall Rd. (Township Rte. 993)
Titusville vic.
Crawford County
Pennsylvania

HAER No. PA-495

PHOTOGRAPHS

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PINE CREEK BRIDGE
(East Titusville Bridge)

HAER No. PA- 495

Location:	Spanning Pine Creek at Messerall Rd. (Township Rt. 993), East Titusville vicinity, Crawford County, Pennsylvania.
USGS Quadrangle:	Titusville South, Pennsylvania (7.5-minute series, 1973).
UTM Coordinates:	17/613600/4608500
Date of Construction:	1876.
Designer / Fabricator:	Wrought Iron Bridge Company (Canton, Ohio).
Builder:	Crawford County.
Present Owner:	Crawford County.
Present Use:	Vehicular bridge.
Significance:	The Pine Creek Bridge is an excellent example of a small wrought-iron bowstring truss. A prefabricated structure, it demonstrates the versatility of wrought iron and the speed with which it could be assembled. The segmented bowstring offered economy of material, simplicity of design, and ease of transport and assembly, the features important to the booming oil economy of nineteenth-century northwestern Pennsylvania.
Historian:	Ben A. Shackleford, August 1998.
Project Description:	The Pennsylvania Historic Bridges Recording Project II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and State Historic Preservation Officer. The fieldwork, measured drawings, historical reports and photographs were prepared under the direction of Eric DeLony, Chief of HAER.

History of East Titusville

Once known as the East Titusville Bridge, the single span crossing Pine Creek as it meanders southward from the hills of Warren County is now known as the Pine Creek Bridge.[1] Many different names have also been attached to Pine Creek. Known variously as Little Oil Creek and the East Oil Creek, it passes through the heartland of the early oil boom from Warren County, through Crawford County, and into Venango County, where it joins Oil Creek.[2]

The changing names of the bridge and of the creek it crosses reflect the frequency and magnitude of shifts in surrounding industry and commerce. Both sets of names speak to the waxing and waning influence of the two largest of the region's principal industries, lumber and oil. To differing degrees and during different decades, both industries relied on the road carried over this creek by the bridge. It has served traffic between eastern Titusville and the towns of Pleasantville and Enterprise, the city of Warren, and the heavily wooded hinterlands of Warren County. Since the oil boom ceased swelling the road to Titusville with wagons of barrels, drilling hardware, oil speculators, and refugees born of wild economic fluctuations, the dense pine forests of northwestern Pennsylvania have yielded a calmer, steady stream of commerce.

Only one structure has occupied this site one-half mile east of Titusville.[3] The present bowstring truss was erected in 1876, and has enjoyed little modification since then, even retaining its wooden floor.[4] The boom of the oil industry probably helped bring about the construction of the bridge roughly one-half mile north of Colonel Drake's well, as the intersection of the Pleasantville road and Pine Creek was not served by a bridge of any sort until 1876.[5] Prior to that date, it is believed that travelers negotiated the crossing by means of a ford.[6]

East Titusville, a town on the periphery of its booming neighbor, blossomed and withered as successive fortunes were won and lost in the bitter struggle to extract natural bounty from the rugged lands of northwestern Pennsylvania. As railroads were built into and out of Titusville, and the hills between it and Titusville have been tamed with modern highways, the eastern route

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[1] Field notes, Karl A. Miller Papers, Crawford County Historical Society, Meadville, Pa.

[2] F. W. Beers, *Atlas of the Oil Region of Pennsylvania* (New York, 1865), 62; Everts, Ensign & Everts, *New Historical Atlas of Crawford County, Pennsylvania, Illustrated, 1876* (Everts, Ensign & Everts, 1876), 145; and Robert C. Brown, et al., *History of Crawford County, Pennsylvania* (Chicago: Warner, Beers & Co., 1885), 62.

[3] Everts, Ensign & Everts, *New Historical Atlas,* 142; Brown et al., *History of Crawford County,* 65.

[4] Field notes, Karl A. Miller Papers.

[5] Everts, Ensign & Everts, *New Historical Atlas.*

[6] Interview with Dr. Bob Smith, local historian, revealed that the Pine Creek Bridge was the first structure on the site. The absence of large stones in the stream bed and the gradually sloping terrain leading to the banks of the stream seem to corroborate the assertion that the bridge was preceded by a ford. See also Kurtanich Engineers & Associates, Inc., "Inspection and Analysis Report, Bridge No. 20," 1992, Crawford County Bridge Engineer's Office, Meadville, Pa.: "there was no evidence of channel debris."

out of Titusville has diminished in significance. Today, East Titusville is but a sparsely built industrial suburb of Titusville, a mere remnant of the prosperity introduced by the oil wells of Venango County to the southeast and the lumber of Warren County to the east. Business has diminished, and travel over the Pine Creek Bridge with it.

Even before the oil strike of 1859, Titusville had begun to prosper. The Pithole Plank Road was begun as a private turnpike in 1838. Due to light traffic and high construction costs, its years of operation were few. The plank road remained after the enterprise vanished, however. Lumber and grain processed at the two mills just north of the East Oil Creek (now Pine Creek) ford no doubt traveled its rutted right-of-way to Titusville.[7]

During the early oil boom, because of its proximity to Drake's Well, the area around the Pine Creek crossing was a hot-bed of real estate speculation and oil prospecting. Watson Farm, located between Titusville and East Titusville along the road to east, was the site of intense speculation and development. Watson Farm, noted one source, was "half a mile below Titusville, on the west side of oil creek and opposite the mouth of East Oil creek, and ... owned by the Pennsylvania Oil Creek petroleum Company, of Philadelphia developing great activity."[8] Clearly the money for speculation around the site of the Pine Creek Bridge flowed in from distant cities. The source continued, "It contains about ninety acres of flat, on which about one hundred wells, mostly put down three years ago, are mostly abandoned in consequence of the low price of oil, though they yielded nearly all from ten to thirty barrels per day."[9] Obviously hitting oil did not guarantee economic success in an economy as volatile as that of northwestern Pennsylvania during the third quarter of the nineteenth century. The oil boom was the sort of volatile economic environment in which a bridge, when citizens slowed down in their pursuit of oil to notice a need for one, had to be erected quickly.

The area of Watson's land beyond the city limits stretching to the banks of Pine Creek became known as Watson Flats, a busy hub of oil speculation and deep drilling. Because of its early prominence, and subsequent intensive development by entities such as the Pennsylvania Oil Creek Petroleum Company, this territory along the road played out early. Soon the meager oil reserves of Crawford County were overshadowed by the larger bounty of Venango County to the south. An 1869 inventory of the resources of the petroleum region notes of East Titusville, "There has been a large amount of money expended here in developing this territory, and it has formerly been a point of much activity in the oil business. It is now very quiet."[10] It remains rather quiet to this day.

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[7] S. P. Bates, *Our Country and Its People* (Boston: W. A. Fergusson & Co., 1899), 175.

[8] Beers, *Atlas of the Oil Region*, 3.

[9] Beers, *Atlas of the Oil Region*, 3.

[10] Andrew Cone, *Petrolia: a Brief History of the Pennsylvania Petroleum Region, Its Development, Growth, Resources, etc., from 1859 to 1869* (reprint, Westport, Conn.: Hyperion Press, 1975), 290.

Other industrial activities continued to move along at a steady pace, affected but not devastated by the wild fluctuations. The two milling operations located just upstream from the bridge site were linked to the lumber industry and local agriculture. Depicted on an 1865 map of the oil region as a saw and a grist mill owned by a Dr. Brewer, by 1874, both mills were in the business of sawing wood.[11] By then they had been sold to Charles Hyde and a Mr. Wardin.[12] These mills and the bridge over Pine Creek are also depicted on an 1876 map of Oil Creek Township, wherein East Titusville lies.[13] The presence of these mills so close to the crossing is evidence of the lumbering activity that continued to shape the fortunes of East Titusville long after the oil ceased flowing.

As testament to the slower pace and lower traffic of the lumber industry, the road has never been paved. Although the plank road across the Pine Creek Bridge was likely replaced with a gravel road during the latter part of the nineteenth century — and as late as 1926 was the main road to Warren — it remains a gravel road.[14] Now designated Messerall Road and Township Route 993, it serves a Weyerhauser lumber mill on the western bank of Pine Creek and a few residences along the eastern bank.

Description

Like many bridge manufacturers of the late nineteenth century, the Wrought Iron Bridge Company built a line of smaller bridges of simple design to suit the needs of smaller clients. As loads grew heavier and skills necessary to construct wooden bridges more scarce, the flexibility of wrought iron was blended into bridge designs. These "bridges in a box" represented a solution, in the versatile medium of iron, to the problem of spanning the numerous chasms and waterways of the rapidly industrializing country. Perhaps nowhere was the demand for quick and easy construction designs more rapidly and readily applied than in the oil region of northwestern Pennsylvania. In his *History of Petroleum,* J. T. Henry describes how towns in the oil region "spring up as if from the touch of the magician's wand — are swept away by fire, or disappear, only to re-appear miles in advance of their last location. They are portable and ported."[15]

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[11] Everts, Ensign & Everts, *New Historical Atlas,* 145; J. H. Lant, compiler, *Titusville, Oil City, and Franklin Directory for 1874* (Titusville, Pa.: J. H. Lant, 1874), 84.

[12] Everts, Ensign & Everts, *New Historical Atlas,* 145; J. H. Lant, compiler, *Titusville, Oil City, and Franklin Directory for 1874* (Titusville, Pa.: J. H. Lant, 1874), 84.

[13] Everts, Ensign & Everts, *New Historical Atlas,* 145.

[14] Ralph and Benedict, *Map of the Public Roads Constructed from Actual Surveys Made under the Direction of the State Highway Department, 1905* (Harrisburg: Pennsylvania Department of Highways, 1926).

[15] J. T. Henry, *History of Petroleum* (New York: Burt Franklin), 587.

Unlike many contemporary bridge companies, which chose to offer trusses of various descriptions, the Wrought Iron Bridge Company solved the problem of supporting a roadway across a short distance with a tied-arch, or bowstring, truss. Where more traditional truss forms are composed of straight elements — an upper and lower chord separated by straight bracing — the tied-arch truss has a long, arched upper chord tied by a lower chord of conventional eye-bars. The gentle arc of the tubular arch ribs and line of the roadway combine into a form visually and functionally equivalent to an archer's strung bow. However, unlike an archer's bow, which acts upon but one arrow, the supportive tension lent the string of roadway is supplied through multiple suspension elements, each tied to the flexed arch above.

A bowstring truss roadway bridge consists of two wrought iron tubes arched in parallel over the gap to be spanned. Using the wrought iron tube as a compression element, and the tension-carrying capacity of wrought iron suspension bars, the bowstring truss represents the maximization of wrought iron's high strength-to-weight ratio. Iron depends on hollow forms, tubes or columns, to act most efficiently in compression. Wrought iron in solid bars, as with the deck suspenders and the lower chord eye-bars, acts very well in tension.

Erected in 1876 by Crawford County, the bridge over Pine Creek was fabricated by the Wrought Iron Bridge Company of Canton, Ohio.[16] The tubes forming the arches are made up of six components riveted together into a form roughly oval in section. The six components are of two basic types. Four rolled sections, corresponding in section to a quarter-circle with flanges radiating outward at 90 degrees, form the curved sides. The curved sections are riveted together in pairs, then attached to two channel sections forming the flat sides of the oval. The channels are placed with their webs to the inside, giving the completed tube an oval section with six pairs of flanges radiating where the rolled shapes are joined. The arches are spaced 15'-7" apart, accommodating a roadway approximately 15'-0" wide.

The arches spring across the stream in an arc reaching 15'-0" above the bottom chord. The top chord members are held apart and restrained from racking by four transverse braces fixed between them at the centermost four panel points, with a vertical clearance of at least 12'-6". One of the braces is currently missing. The transverse braces are riveted I-section members built up from angle sections and double lacing, attached by large bolts to both top and bottom of the arch members.

Though probably a consequence of specifying locally abundant materials to save money, but also lightening the roadway structure, wooden stringers support the road surface. Nine stringers, each roughly 5" by 12" in section and 12'-3" long, hold up the roadway.[17] Atop these stringers, transversely laid wooden planks support a 2"-thick end-grain wearing surface of 2" by 4" wooden blocks. This wearing surface has been coated with a layer of bitumen roughly two inches thick.

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[16] Field notes, Karl A. Miller Papers.

[17] Kurtanich Engineers and Associates, Inc., "Inspection and Analysis Report."

Abutments and wing walls of mortar-joined rough-cut stone hold the structure 11'-8" over the creek. Ends of the upper-chord tubes rest in sockets cast into the iron shoes set atop the abutments. These shoes, fixed at one end of the span, also provide anchor for the pins securing the arch's lower chord. The shoes rests atop huge monolithic stones that, in pairs, compose most of the top course of the abutment. Straight wing walls issue outward from beneath the shoes and are stepped downward and outward at roughly forty-five degrees for nearly 10'-0" on each side of the abutments.

The roadway between the two masonry abutments is supported by two alternating varieties of tension elements threaded vertically through the tubular arch by cast wedge escutcheons. Connections to the upper and lower chords are secured by 1-1/2"-diameter threaded wrought iron rods forged integrally with a flattened rivet plate. The vertical tension elements are built in two distinct forms. The more complex suspender type, of which there are six, are composed of laced webs and angle-section flanges that taper together from parallel as they approach the upper chord arch, where they are riveted onto wrought iron connection plates. At the bottom, flange elements attach to smaller plates with threaded rods that extend through the floor beams' flanges. These open-web suspenders support the second, fourth, and sixth floor beams on either side. The more simple suspension elements, supporting the first, third, fifth, and seventh floor beams, are but four angle sections, spaced and riveted back-to-back to form a member which has an open cross-shaped section. U-bolt hangers run through a cast seat riveted into their base, clamping together the lower end of each cross-shaped hanger, lower chord tie bars, and the floor beam.

Each of the fourteen truss panels is braced by diagonal rods roughly 3/4" in diameter. These diagonals are threaded through the arch tube itself at the top, and cast clamp blocks either held within the open cross-shaped hangers, or straddled by the open-web hangers. The diagonals form an "X" in all but the end-most panels, where one diagonal roughly perpendicular to the arch rib is used.

A railing of 3"-diameter pipe is affixed by eye-bolts and U-bolts to the vertical tension elements, and extends little beyond the entrance to the through arch. The tie bars comprising the lower chord parallel the railing, just between the elevation of the floor beams and the roadway deck. Each "string" of the bowstring is composed of multiple 1" x 4" solid wrought-iron bars spliced with riveted gusset plates at intervals staggered from side to side. The tie bars are pinned on either end where the bowed arch meets the support shoe. The entire iron superstructure of the bridge is painted with silver aluminum paint. A 1903 photograph of the bridge reveals that it was once a darker color, likely black, and had a wooden railing.

A cast-iron plaque fixed to the center of the eastern upper arch brace reads: "Wrought Iron Bridge Co., Builders Canton, Ohio. Pat. April 26 1870 & Feb 11 1873." The pertinent patents are for an "Improvement In Tubular Arch-Girders" and "Improvements In Tubular Arch-Girders For Bridges And Other Structures," and primarily cover the method of constructing the

tubular section arches and their cast-iron shoes.[18] Both patents were registered to David Hammond and Job Abbott of Canton, Ohio, proprietors of the Wrought Iron Bridge Company during 1876. Abbott joined the firm some time before the 1870 patent. Begun in 1864 by David Hammond, the Wrought Iron Bridge Company manufactured bridges in Canton until absorption into the J. P. Morgan-funded conglomerate of the American Bridge Company in 1900.[19]

Conclusion

Though bypassed by most contemporary vehicular traffic, the Pine Creek Bridge does serve local fishermen. Despite the ravages of time and neglect, this excellent example of a small bowstring truss serves as fitting testament to an age when the best structural form for a small iron bridge was a wide-open question, and simplicity and assembly were necessary virtues.

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[18] David Hammond and Job Abbott, "Improvement In Tubular Arch-Girders For Bridges And Other Structures," U.S. Patent No. 102,392 (26 Apr. 1870); ibid., "Improvement in Tubular Arch-Girders," U.S. Patent No. 102,393 (26 Apr. 1870).

[19] Victor C. Darnell, *American Bridge-Building Companies,* Occasional Publication No. 4 (Washington, D.C.: Society for Industrial Archaeology, 1984), 48.

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